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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/525,450

09/01/2005

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EXAMINER

CHUANG, ALEXANDER

ART UNIT

PAPER NUMBER

1795

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/525,450	<b>Applicant(s)</b> WALTER, MARKUS	
	<b>Examiner</b> Alexander Chuang	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 September 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 19-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 19-35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2/24/2005</u> .   | 6) <input type="checkbox"/> Other: _____                          |

**FUEL CELL WITH A REGULATED OUTPUT**

***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 30 and 32 recites the limitation "voltage sensor" in 3<sup>rd</sup> line of each claim. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 19, 22-25, 31-32, and 34-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Autenrieth et al (US 2002/0057066 A1).

As to claim 19, Autentrieth et al disclose a fuel cell system comprising a fuel cell (3), an electric circuit (9) which electrically connected the fuel cell and the battery (intermediate electrical accumulator, 8) to the ballast resistor (electrical consumer, 12), a pressure sensor (14), and a switch (10) where in the open state, the fuel cell is electrically connected to the battery and

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ballast resistor and in the closed state, the fuel cell is electrically disconnected from the battery and ballast resistor. The switch is controlled by pulse-width modulation (i.e. pulse width due to a variable function as discussed in paragraph 16) which is a pulse duty factor variable as an operating parameter as defined in paragraph 13 of the instant disclosure.

As to claim 22, the switch is thermally coupled to the fuel cell (see figure 2).

As to claim 23, the switch is situated at the end of the stack (see figure 2).

As to claim 24, the switch is controlled by the load requirements of the system (paragraph 29).

As to claim 25, the switch is open when the load requirement exceeds the fuel cell output (paragraph 21). When the fuel pressure is above the threshold, the switch is closed (paragraph 30).

As to claim 30, the switch is on or off depending on the hydrogen pressure (paragraph 25).

As to claim 31, a pressure sensor (14) is located upstream of the fuel cell (see figure 2).

As to claim 32, the switch is off (open state) when the pressure is below a predetermined value (paragraph 29); the switch is on (closed) when the pressure is above a threshold (paragraph 30).

As to claim 34, the fuel cell is coupled to a reformer (paragraph 11).

As to claim 35, the switch is open when the hydrogen pressure of the fuel cell is low due to consumption and increase in power requirement (paragraph 30). The fuel cell is switched off (open state) until the fuel quantity reaches a threshold where the fuel cell provides more electric power (paragraph 30).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 20-21 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al (US 2002/0057066 A1) as applied to claim 19, 22-25, 31-32, and 34-35 above, and further in view of Glennon (US 4,532,443).

As to claims 20-21, Autenrieth et al disclosed a fuel cell as discussed above; however, the reference does not explicitly disclose the type of switch used. Glennon disclose a power switching circuit comprising a metal oxide semiconductor field effect transistor (MOSFET) capable of high switching speeds (1: 10-12). The reference teaches the turn on delay time of the switch is in the order of 35 nanoseconds and the turn off delay time is 150 nanoseconds (2: 41-45). Therefore, it would have been obvious to one of ordinary skill in the art to use a MOSFET switch in the fuel cell system of Autenrieth et al, because Glennon teaches MOSFET switches have high speed switching action which is needed for powering loads from a DC supply.

As to claim 26, Autenrieth et al does not explicitly disclose the pulse frequency is between 0.1 to 50 kHz. Glennon teaches the switching circuit uses modulated pulses to control the switch (1: 58-65). Furthermore, the switch is controlled by width modulation (2: 10-12) and the frequency of the control signal is in the order of 10 kHz (2: 46-48). Therefore, it would have been obvious to one of ordinary skill in the art to control a switch using width modulated pulses

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in the fuel cell system of Autenrieth et al, because Glennon teaches the frequency of the pulse width modulation to control the power load is in the order of 10 KHz.

8. Claims 27-28 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al (US 2002/0057066 A1) as applied to claims 19, 22-25, 31-32, and 34-35 above, and further in view of Ueno et al (US 2001/0001287 A1).

As to claims 27 and 28, Autenrieth et al disclosed a fuel cell as discussed above; however, the reference does not explicitly state the presence of a voltage sensor and a control system based on output voltage of the fuel cell. Ueno et al teaches an output voltage sensor detects the fuel cell voltage (paragraph 20). The reference states said sensor prevents an excessive load on the fuel cell; the excessive load may damage the electrolyte membrane in the fuel cell (paragraph 20). Therefore, it would have been obvious to one of ordinary skill in the art to incorporate a voltage sensor in the fuel cell of Autenrieth et al and use it to control the switch, because Ueno et al teaches the electrolyte membrane of the fuel cell may be damaged due to the high voltage required from the load.

As to claim 33, Autenrieth et al disclose pulse-width modulation signals are used to control the switch; however, the reference does not explicitly disclose applying the same control scheme to a gas feed line valve. Ueno et al disclose a pressure sensor (25) situated downstream of a valve (21) in the fuel stream (10a). The reference states hydrogen gas is regulated at a pressure range and if the pressure is below this range, hydrogen gas may be leaking; if the pressure is over the predetermined range, the valve may be malfunctioning (paragraph 44). Additionally, Ueno et al states a high gas pressure may damage the electrolyte membrane

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(paragraph 44). Therefore, at the time of invention, it would have been obvious to use the pulse-with modulation signal control scheme of Autenrieth et al to measure the pressure of a gas stream and control the valve, because high pressure may damage the electrolyte membrane of the fuel cell and a low pressure stream may be indicative of a fuel leak.

9. Claims 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al (US 2002/0057066 A1) as applied to claims 19, 22-25, 31-32, and 34-35 above, and further in view of Nonobe (US 2002/019220 A1).

Autenrieth et al disclosed a fuel cell as discussed above; however, the reference did not explicitly specify which type of sensor and the opening or closing of the switch based on resistance. Nonobe disclosed a resistance detector (48) in the fuel cell system. The reference states the proton conductivity of the electrolyte changes with the humidity of electrolyte which affects resistance (paragraph 32). Furthermore, Nonobe disclose abnormality of the fuel cell is detected if humidification of the electrolyte membrane does not change; thus operation is ceased to avoid damage of the fuel cell. Therefore, it would have been obvious to use a resistance sensor in the fuel cell system of Autenrieth, because Nonobe teaches proton conductivity of the electrolyte is affected by the internal resistance of the fuel cell and to measure the internal resistance to avoid damage to the fuel cell.

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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Chuang whose telephone number is (571)270-5122. The examiner can normally be reached on Monday to Thursday 8:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571)-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AC  
Alexander Chuang  
Patent Examiner GAU 1795  
December 18<sup>th</sup> 2008

/Dah-Wei D. Yuan/  
Supervisory Patent Examiner, Art Unit 1795